

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

To: W.E. Denniston
From: Brian Reicks
Date: 8/28/75

Subject: Styrene Loss at
BASF Wyandotte
North Plant
Spill # 1072-75

On Sept. 27, 1975 at 7:30 PM Basin Engineer Wayne Denniston received a call from Bill Leisten of BASF Wyandotte Corporation. He reported a loss of 10,000 gallons of styrene over a three week period. The loss had apparently gone through sand and into the ground water.

There was a tank containing styrene which developed a leak in the base. The tank had concrete dike sides but a sand bottom. The leak was not noticed because the level indicator was stuck and did not reflect the loss.

Engineer Stan Novak and the writer checked the spill site on the morning of Sept. 28. We met with Bill Leisten and Dale Roush. Marine Pollution Control was on scene pumping styrene from a concrete electrical conduit which passed next to the tank. BASF personnel assured us that there were no drains in the area.

We suggested that some holes be dug to make sure that the styrene was not going through the groundwater toward the Detroit River. Samples and pictures were taken. It should be noted that the tank and styrene were not mentioned in BASF Wyandotte's PIPP. Further checking of the area will be needed to insure total clean-up of the styrene.

cc: J. Bohunsky
R. Schrameck

BR:gm

US EPA RECORDS CENTER REGION 5



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1072-

Table 1 Fathead minnow mortality after exposure to various concentrations of BASF Wyandotte effluent from outfall 820180 (001).

Nominal Effluent Concentration %	<u>Percent Mortality/Exposure Period</u>								
	2 hours	7 hours	18 hours	24 hours	31 hours	41 hours	48 hours	72 hours	96 hours
100	100	--	--	--	--	--	--	--	100
88	100	--	--	--	--	--	--	--	100
75	70	85	85	100	--	--	--	--	100
66	80	80	80	100	--	--	--	--	100
50	0	5	5	10	10	20	20	30	35
33	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

96 hour LC50 = 53% effluent
 approximate 95% confidence limits = 48 and 59% effluent

Table 2 Results of a 48-hour static *D. magna* toxicity test conducted with effluent from outfall 820180 (001)
at BASF Wyandotte - 6/23-25/81.

a. Biological Data

Nominal % Effluent	% immobilized at	
	24 hours	48 hours
100	0	0
88	0	10
75	0	10
66	0	0
50	0	0
33	0	0
25	0	0
12	0	0
0 (control)	0	10

48-hour ECSO: Cannot be determined - insufficient immobilization.

b. Chemical/Physical Data

Parameter	6/23/81			6/25/81		
	Control	50%	100%	Control	50%	100%
Dissolved oxygen (mg/l)	8.2	7.2	6.1	8.2	7.5	7.3
Oxygen saturation (%)	99	87	74	95	87	85
pH (S.U.)	8.1	8.0	7.9	8.2	8.0	7.9
Temperature (°C)	24	24	25	22	22	22
Conductivity (umhos)	226	240	247	226	239	246
Alkalinity (mg/l)	--	--	--	88	--	88
Hardness (mg/l)	--	--	--	100	--	100

Table 3 Results of a 48-hour static D. magna toxicity test conducted with effluent from outfall 820178 (003)
at BASF Wyandotte - 6/23-25/81.

a. Biological Data

Nominal % Effluent	% immobilization at	
	24 hours	48 hours
100	0	10
75	0	0
50	0	0
25	0	0
10	0	0
0 (control)	0	0

48 hour EC50: Cannot be determined - insufficient immobilization.

b. Chemical/Physical Data

Parameter	6/23/81			6/25/81		
	Control	50%	100%	Control	50%	100%
Dissolved oxygen (mg/l)	8.4	8.5	8.6	8.5	8.3	8.2
Oxygen Saturation (%)	98	99	98	94	92	91
pH (S.U.)	7.8	7.8	7.8	8.2	8.2	8.2
Temperature (°C)	22	22	21	20	20	20
Conductivity (umhos)	234	796	1360	231	787	1330
Alkalinity (mg/l)	84		140	--		
Hardness (mg/l)	100		180	--		

Table 4 On-site analyses of effluent grab samples collected at BASF Wyandotte Corporation, outfall 820180 during 6/22-26/81.

Date	Time	Temp.* (°C)	pH (S.U.)	Conductivity (umhos)	D.O. (mg/l)	Chlorine (mg/l)	Alkalinity (mg/l)	Hardness (mg/l)
6-22-81	1400	23	7.6	597	4.8	Trace ^①	--	--
	1740	22	7.8	270	5.4	U ^②	--	--
	2140	22	7.8	262	4.8	U	88	110
6-23-81	0800	21	7.7	277	5.3	--	96	110
	1125	23	7.6	260	3.9	U	--	--
	1550	24	7.7	306	4.1	--	--	--
	2140	21	7.8	249	6.0	U	--	--
6-24-81	0740	22	7.7	251	4.9	U	--	--
	1140	22	7.7	251	5.5	--	100 ^③	110 ^③
	1540	23	7.7	309	3.7	--	--	--
	2130	22	7.2	301	3.2	--	--	--
6-25-81	0840	21	7.6	303	4.2	U	--	--
	1120	23	7.6	287	3.9	U	--	--
	1515	25	7.0	260	1.6	--	96	110
	2125	22	7.5	288	3.4	--	--	--
6-26-81	0840	22	7.6	321	2.9	U	88	100
	1140	23	7.8	240	4.4	--	--	--
	1405	23	7.9	250	4.5	--	--	--

* - After the heat exchanger

① - Trace: present in quantity << detection limit of 0.2 mg/l

② - U = undetected

③ - Actual analyses performed at 1040

Table 5 On-site analyses of diluent (Detroit River) grab samples collected during 6/22-26/81.

<u>Date</u>	<u>Time</u>	<u>Temp.*</u> (°C)	<u>pH</u> (S.U.)	<u>Conductivity</u> (umhos)	<u>D.O.</u> (mg/l)	<u>Chlorine</u> (mg/l)	<u>Alkalinity</u> (mg/l)	<u>Hardness</u> (mg/l)
6-22-81	1400	22	7.9	244	7.4	Trace ^①	--	--
	1740	21	7.9	240	7.4	--	--	--
	2140	21	7.9	234	7.6	U ^②	84	110
6-23-81	0800	21	7.9	241	8.0	--	88	100
	1125	22	7.9	231	8.2	U	--	--
	1550	22	8.1	225	8.5	--	--	--
	2140	20	7.9	237	8.5	U	--	--
6-24-81	0740	20	7.7	238	8.4	Trace	--	--
	1140	21	7.9	231	8.5	--	84 ^③	100 ^③
	1540	21	7.9	229	8.4	--	--	--
	2130	20	7.9	233	8.6	--	--	--
6-25-81	0840	22	7.8	231	8.4	Trace	--	--
	1120	21	7.8	228	8.4	U	--	--
	1515	22	8.0	220	8.4	--	88	100
	2125	21	7.8	227	8.4	--	--	--
6-26-81	0840	20	7.9	226	8.4	U	88	100
	1140	21	8.0	225	8.3	--	--	--
	1405	21	7.9	225	8.3	--	--	--

* - After the heat exchanger

① - Trace = present in quantity << detection limit of 0.2 mg/l

② - U = undetected

③ - Actual analyses performed at 1040

Table 6 Laboratory analyses of effluent composite samples collected from outfall 820180 (001) at BASF Wyandotte Corporation.

Sample Period	From	6-22-81 - 1600	6-24-81 - 0815
	To	6-23-81 - 1600	6-25-81 - 0815
Computed flow rate ^① (M ³ /day)		23,000	25,000
Suspended solids		mg/l	kg/day
Dissolved solids		13	300
COD	150	3,400	20
TOC	97	2,200	170
Cyanide (Total)	31	710	180
Cyanide (Free)	0.009	0.2	34
Sulfide	< 0.009	--	--
BOD ₅	< 0.02 ^②	--	--
Nitrite & nitrate nitrogen-N	24	550	15
Ammonia nitrogen-N	0.31	7.1	500
Kjeldahl nitrogen-N	0.32	7.4	20
Total phosphorus-P	1.3	30.	170
Chlorides	0.09	2	850
MBAS	18.2	419	482
Phenol	0.02 ^③	0.5	--
Total cadmium (Cd)	174	0.39	84
Total chromium (Cr)	< 20	--	< 20
Hexavalent chromium (Cr ⁺⁶)	< 50	--	< 50
Total copper (Cu)	< 2	--	--
Total nickel (Ni)	< 20	--	< 20
Total lead (Pb)	< 50	--	< 50
Total zinc (Zn)	< 50	--	< 50
Total iron (Fe)	580	13	--
Total mercury (Hg)	< 1	--	--
Polynuclear aromatic hydrocarbons	< 1	--	--
PCB 1242	< 0.1	--	--
PCB 1254	< 0.1	--	--
PCB 1260	< 0.1	--	--
Other PCB's & organochlorine pesticides	U ^⑤	--	--

① - Flow rates used in the computation of kg/day-obtained from company MOR.

② - Possible interference

③ - Maximum holding time was exceeded

④ - Analytical method not yet approved by laboratory

⑤ - U = undetected

To obtain MGD multiply M³/day by 0.0002642

To obtain lbs/day multiply kg/day by 2.205

Table 7 Laboratory analyses of effluent grab samples collected from outfall 820180 (001) at BASF Wyandotte Corporation.

Date Time	6-22-81 1610	6-22-81 2315	6-23-81 0850	6-23-81① 1135	6-24-81 2150	6-25-81 0805
	<u>mg/l*</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l*</u>	<u>mg/l</u>	<u>mg/l</u>
Suspended solids	15	8	16	--	--	--
Dissolved solids	140	140	180	--	--	--
COD	53	42	420	--	--	--
TOC	14	14	110	--	--	--
BOD ₅	8.0	12.	78.	--	--	--
Chlorine Residual	U②	U	U	U	--	--
Nitrite & nitrate nitrogen-N	0.37	0.33	0.28	--	--	--
Ammonia nitrogen-N	0.29	0.27	0.43	--	--	--
Kjeldahl nitrogen-N	1.3	0.87	1.8	--	--	--
Total phosphorus-P	0.09	0.06	0.11	--	--	--
Chlorides	21.	16.	33.	--	--	--
Oil & Grease (Grav.)	6	< 2	15	--	--	--
Oil & Grease (I.R.)	14	1	11	--	--	--
Petroleum hydrocarbons	11	< 1	4	--	--	--
	<u>ug/l</u>	<u>ug/l</u>	<u>ug/l</u>	<u>ug/l</u>	<u>ug/l</u>	<u>ug/l</u>
Phenol	6③	11③	30③	--	--	--
Total aromatic amines	< 100	< 100	< 100	< 100	< 100	< 100
Total aliphatic amines	220	130	240	160	280	200
Chloroform	< 10	< 10	< 10	< 10	< 1	< 1
1,2-dichloroethane	< 10	< 10	< 10	--	--	--
1,2-dichloropropane	< 10	< 10	< 10	--	--	--
Benzene	< 10	< 10	< 10	55	< 10	< 10
Toluene	< 10	< 10	< 10	15	23	< 10
Xylene	< 10	< 10	< 10	--	--	--
Styrene	< 10	< 10	< 10	< 10	20	< 10
Ethylbenzene	< 10	< 10	< 10	< 10	< 10	< 10
Acrylonitrile	< 1000	< 1000	< 1000	U	--	--
Trichloroethylene	--	--	--	--	--	2
Other purgeable hydrocarbons	U	U	U	U	U	U

* - Collected during a period of fish stress and turnover.

① - Collected inside mobile laboratory rather than at the outfall sampling site.

② - U = undetected

③ - Analytical method not yet approved by laboratory.

Table 8 Laboratory analyses of diluent composite samples collected from the Detroit River at BASF Wyandotte's north intake.

Sample Period	From	6-22-81 - 1630	6-24-81 - 0755
	To	6-23-81 - 1630	6-25-81 - 0755
<u>mg/l</u>			
Suspended solids		11	17
Dissolved solids		160	140
COD		8	14
TOC		3.0	3.7
Cyanide (Total)		< 0.005	--
Sulfide		< 0.02	--
BOD ₅		2.9	2.3
Nitrite & nitrate nitrogen-N		0.31	--
Ammonia nitrogen-N		0.33	0.35
Kjeldahl nitrogen-N		0.63	0.61
Total phosphorus-P		0.06	0.03
Chlorides		13.5	12.3
MBAS		0.02 ⁽¹⁾	--
<u>ug/l</u>			
Phenol		5 ⁽²⁾	3 ⁽²⁾
Total cadmium (Cd)		< 20	< 20
Total chromium (Cr)		< 50	< 50
Hexavalent chromium (Cr ⁺⁶)		< 2	--
Total copper (Cu)		< 20	< 20
Total nickel (Ni)		< 50	< 50
Total lead (Pb)		< 50	< 50
Total zinc (Zn)		< 50	< 50
Total iron (Fe)		270	--
Polynuclear aromatic hydrocarbons		< 1	--
PCB 1242		< 0.1	--
PCB 1254		< 0.1	--
PCB 1260		< 0.1	--
Other PCB's & organochlorine pesticides		U ⁽³⁾	--

⁽¹⁾ - Maximum holding time exceeded.

⁽²⁾ - Analytical method not yet approved by laboratory.

⁽³⁾ - U = undetected

Table 9 Laboratory analyses of diluent grab samples collected from the Detroit River at BASF Wyandotte Corporation.

Sample Location	North Intake ^①				At the Diluent Pump
Date	6-22-81	6-23-81	6-24-81	6-25-81	6-23-81
Time	2330	0915	2155	0750	0910
	<u>mg/l</u>				<u>mg/l</u>
COD	6	8			15
TOC	3.5	3.5			3.4
Chlorides	12.8	13.0			12.9
Oil & Grease (Grav.)	< 2	< 2			--
Oil & Grease (I.R.)	< 1	< 1			--
Petroleum hydrocarbons	< 1	< 1			--
	<u>ug/l</u>	<u>ug/l</u>	<u>ug/l</u>	<u>ug/l</u>	<u>ug/l</u>
Total aliphatic amines	< 100	< 100	< 100	< 100	< 100
Total aromatic amines	< 100	< 100	< 100	< 100	< 100
Toluene	< 10	< 10	< 10	< 10	< 10
Xylene	< 10	< 10	--	--	--
Styrene	< 10	< 10	< 10	< 10	< 10
Benzene	< 10	< 10	< 10	< 10	< 10
Ethylbenzene	< 10	< 10	< 10	< 10	< 10
Chloroform	< 10	< 10	< 1	< 1	< 10
Trichloroethylene	--	--	Trace ^②	3	--
1,2-dichloroethane	< 10	< 10	--	--	--
1,2-dichloropropane	< 10	< 10	--	--	--
Acrylonitrile	< 1,000	< 1,000	--	--	U
Other purgeable hydrocarbons	U ^③	U	U	U	U

^① - Additional intake data are available in a 1981 report by Rock and Browne.

^② - Present in quantity less than detection limit.

^③ - U = undetected

Table 10 Laboratory analyses of selected effluent grab samples collected at outfall 820178 (003).①

Date Time	6/23/81 0815	6/23/81 1215
	<u>mg/l</u>	<u>mg/l</u>
Suspended solids	23	10
Dissolved solids	1,200	780
COD	300	120
TOC	83	37
BOD ₅	11.	16.
Nitrite & nitrate nitrogen-N	0.46	0.40
Ammonia nitrogen-N	0.95	0.84
Kjeldahl nitrogen-N	2.6	2.1
Total phosphorus-P	0.23	0.24
Chlorides	510	320
Oil & Grease (I.R.)	38	13
Oil & Grease (Gravimetric)	68	28
Petroleum hydrocarbons	25	9
	<u>ug/l</u>	<u>ug/l</u>
Phenol	29②	22②
Total aliphatic amines	460	130
Total aromatic amines	< 100	< 100
Benzene	< 10	< 10
Toluene	< 10	< 10
Xylene	< 10	< 10
Styrene	< 10	< 10
Ethylbenzene	< 10	< 10
Acrylonitrile	< 1,000	< 1,000
Chloroform	< 10	< 10
1,2-Dichloroethane	120	39
1,2-Dichloropropane	1,400	1,200
Other purgeable hydrocarbons	U③	U

① - Addition grab and composite sample data available in Rock and Browne (1981).

② - Analytical method not yet approved by laboratory.

③ - U = undetected.

Table 11 Comparison of study results with BASF Wyandotte Corporation's NPDES Permit (MI0000540).

Parameter (Unit)	NPDES Permit Final Limitations		Study Results ^①	
	Average	Maximum	6/22-23/81	6/24-25/81
820180 (001)				
Flow (M ³ /day)	--	--		
BOD ₅ (mg/l)	--	--	24 (8.0, 12., 78.)	15
Suspended solids (mg/l)	20 net ^②	60 net	2	3
Suspended solids (kg/day)	811 net	2434 net	46	75
Total phosphorus (mg/l?)	1.0	2.0	0.09 (0.09, 0.06, 0.11)	0.06
Total phosphorus (kg/day)	41	81	2	2
Chlorides (mg/l)	--	--	18.2 (21., 16, 33.)	19.3
Chlorine (mg/l)	--	0.5	(U, U, U ^③ - See also Table 4)	
COD (mg/l)	--	--	97 (58, 42, 420)	180
Petroleum hydrocarbons ^④ (mg/l)	--	10	(11, <1, 4)	
Phenol (ug/l)	--	--	17 (6, 11, 30)	8
pH (S.U.)	not <6.5 nor >9.5		Study Maximum = 8.4 @ 1115 6/26/81 ^⑤	
			Study Minimum = 6.8 @ 1730 6/25/81	
<u>Intake^⑥</u>				
Suspended solids (mg/l)	--	--	11	17

① - Study results are taken from Tables 6 - 8. Results in parentheses () are for grab samples. Others are composite sample data. To obtain MGD multiply M³/day by 0.0002642 - to obtain lbs/day, multiply kg/day x 2.205.

② - Net = difference between discharge and intake values.

③ - U = undetected.

④ - As defined by Environmental Monitoring & Support Laboratory, U.S.EPA, Cincinnati, OH (7/75).

⑤ - From a continuous pH recording of the 96-hour study period.

⑥ - Data presented here are from the north (polyols) intake. The south intake (820407) was monitored by BWC for permit reporting purposes at the time of the study.